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(54) **SYSTEM AND METHOD FOR SHARING DATA BASED ON A COMBINED BANDWIDTH CONSUMPTION**

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Related U.S. Application Data

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(51) **Int. Cl.**

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H04W 24/08	(2009.01)
H04W 4/70	(2018.01)
H04W 28/20	(2009.01)

(52) **U.S. Cl.**
CPC ***H04W 24/08*** (2013.01); *H04W 4/70* (2018.02); *H04W 28/20* (2013.01)

(58) **Field of Classification Search**
CPC H04L 12/50
USPC 370/401
See application file for complete search history.

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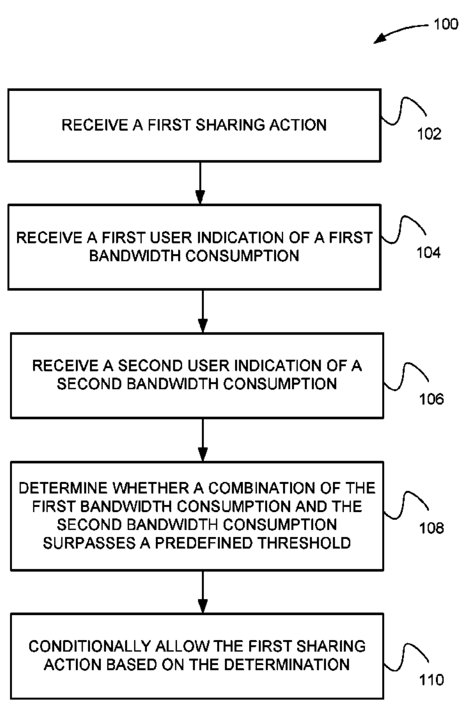
(57) **ABSTRACT**

A system, method, and computer program product are provided for sharing data based on a combined bandwidth consumption. In use, a first sharing action is received. Next, a first bandwidth consumption is received. Further, a second bandwidth consumption is received. Additionally, it is determined whether a combination of the first bandwidth consumption and the second bandwidth consumption surpasses a predefined threshold. Lastly, the first sharing action is conditionally allowed based on the determination. Additional systems, methods, and computer program products are also presented.

19 Claims, 11 Drawing Sheets



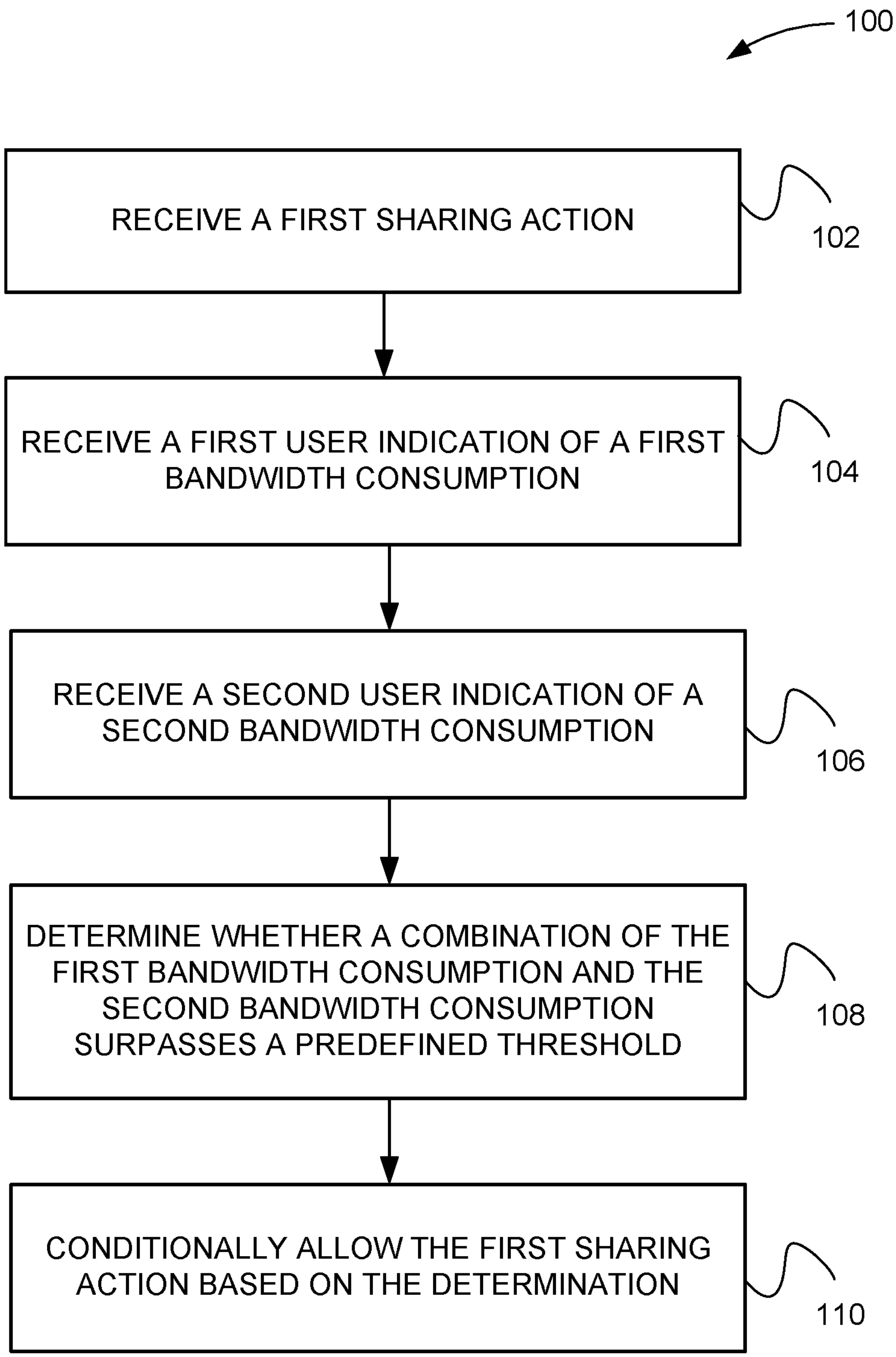

100
RECEIVE A FIRST SHARING ACTION
102
RECEIVE A FIRST USER INDICATION OF A FIRST BANDWIDTH CONSUMPTION
104
RECEIVE A SECOND USER INDICATION OF A SECOND BANDWIDTH CONSUMPTION
106
DETERMINE WHETHER A COMBINATION OF THE FIRST BANDWIDTH CONSUMPTION AND THE SECOND BANDWIDTH CONSUMPTION SURPASSES A PREDEFINED THRESHOLD
108
CONDITIONALLY ALLOW THE FIRST SHARING ACTION BASED ON THE DETERMINATION
110

Figure 1

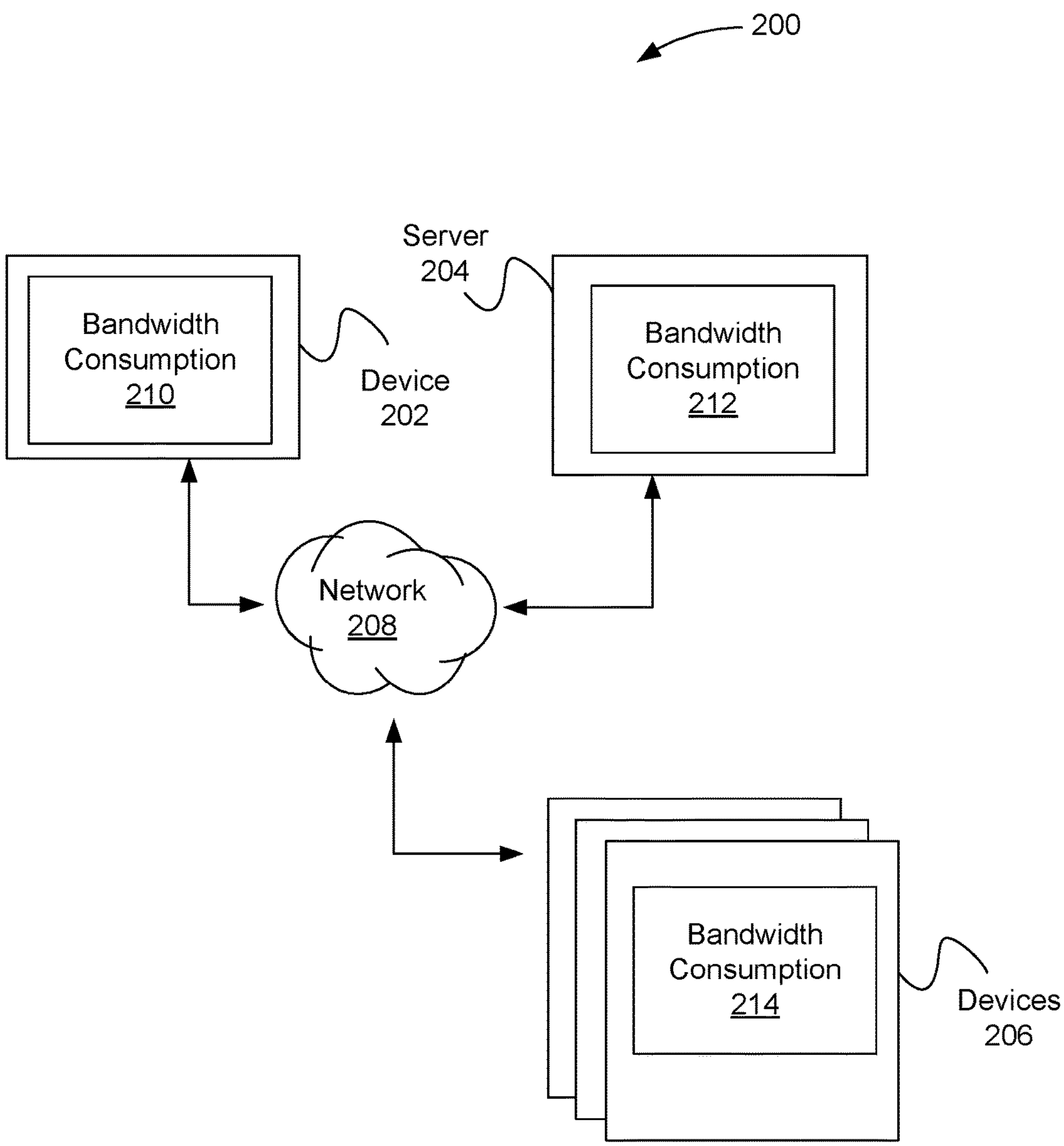

200
Server
204
Bandwidth
Consumption
210
Device
202
Bandwidth
Consumption
212
Network
208
Bandwidth
Consumption
214
Devices
206

Figure 2

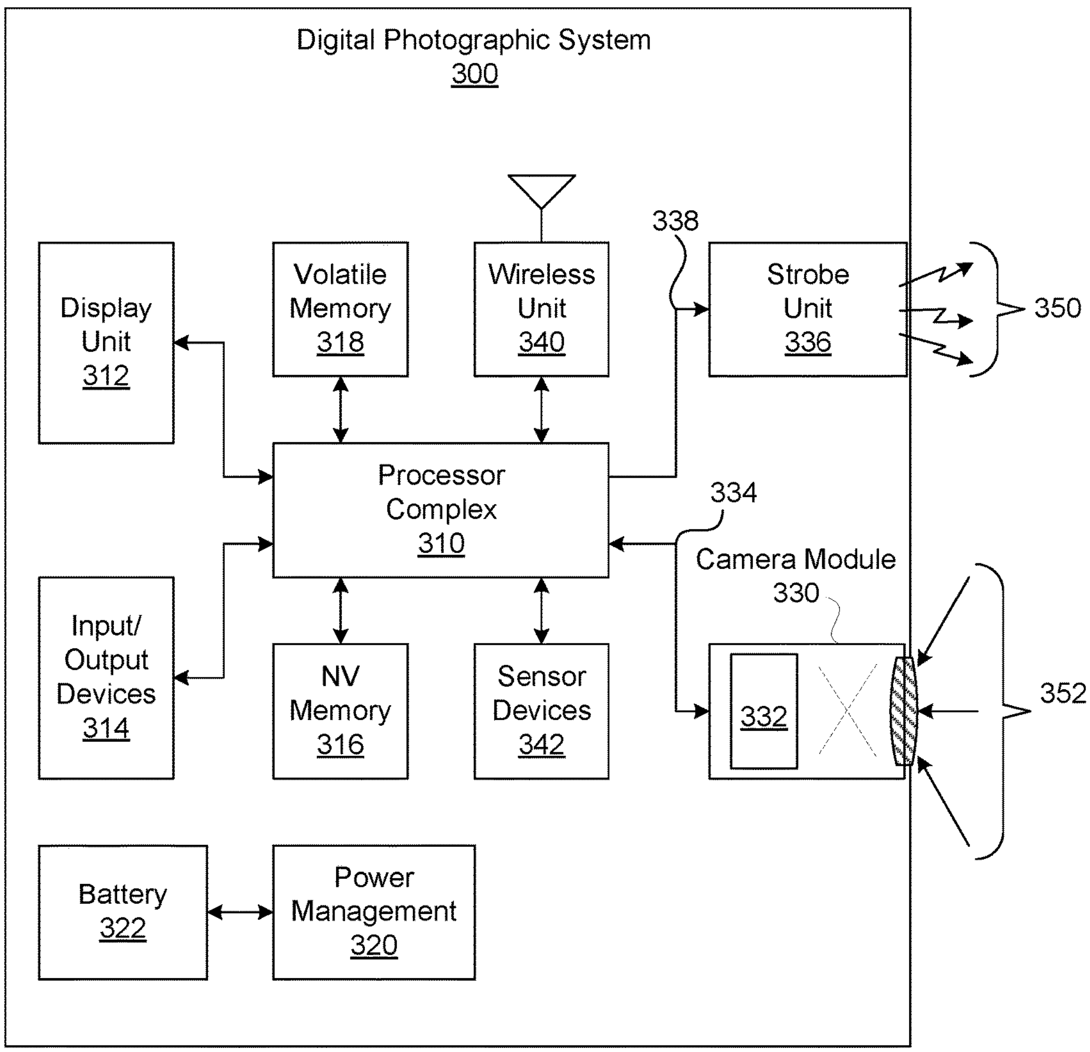

Digital Photographic System
300
338
Display
Unit
312
Volatile
Memory
318
Wireless
Unit
340
Strobe
Unit
336
350
Processor
Complex
310
334
Camera Module
330
Input/
Output
Devices
314
NV
Memory
316
Sensor
Devices
342
332
352
Battery
322
Power
Management
320

Figure 3A

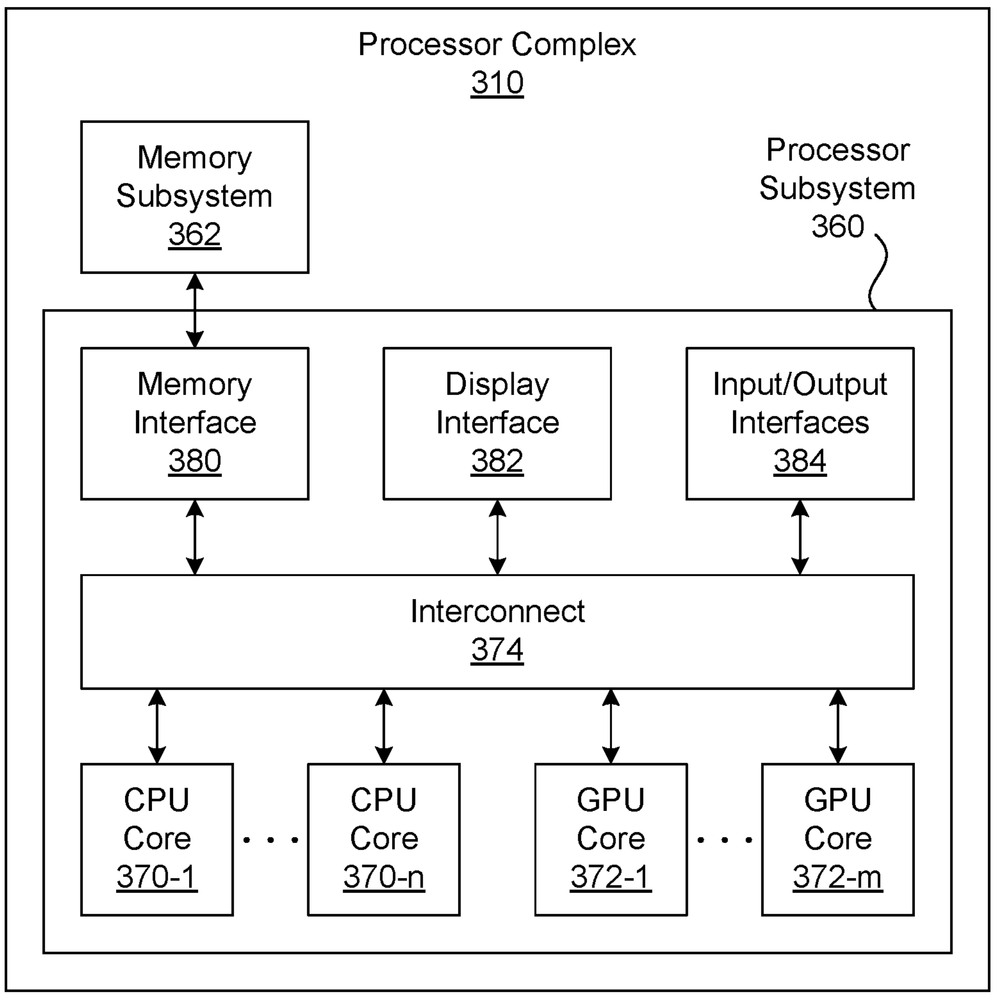

Processor Complex
310
Memory Subsystem
362
Processor Subsystem
360
Memory Interface
380
Display Interface
382
Input/Output Interfaces
384
Interconnect
374
CPU Core
370-1
CPU Core
370-n
GPU Core
372-1
GPU Core
372-m

Figure 3B

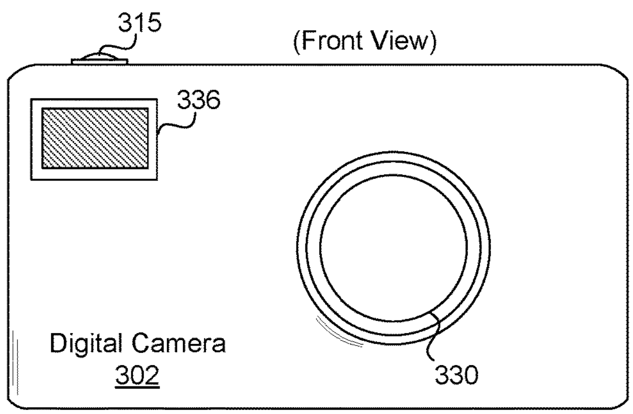


Figure 3C

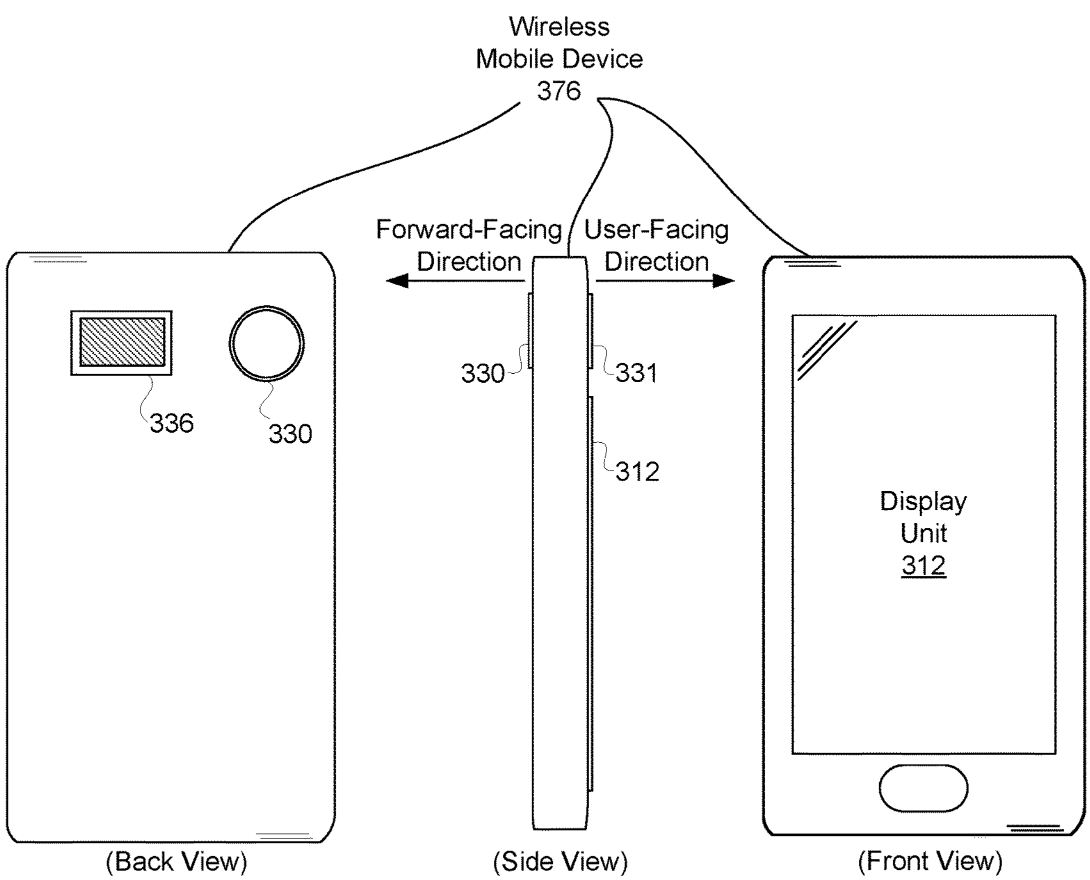


Figure 3D

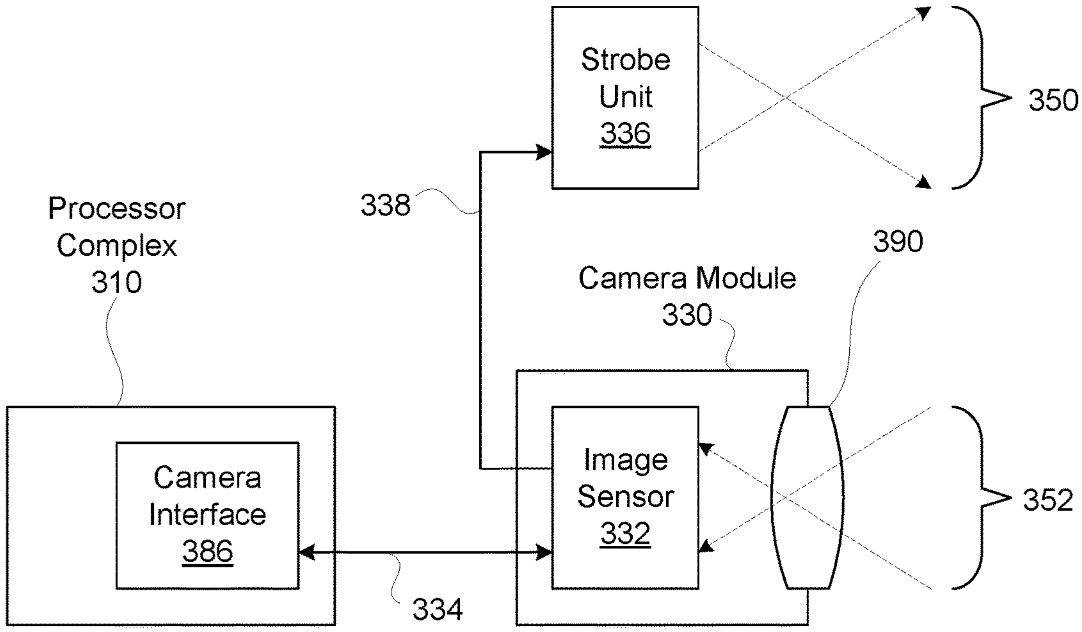


Figure 3E

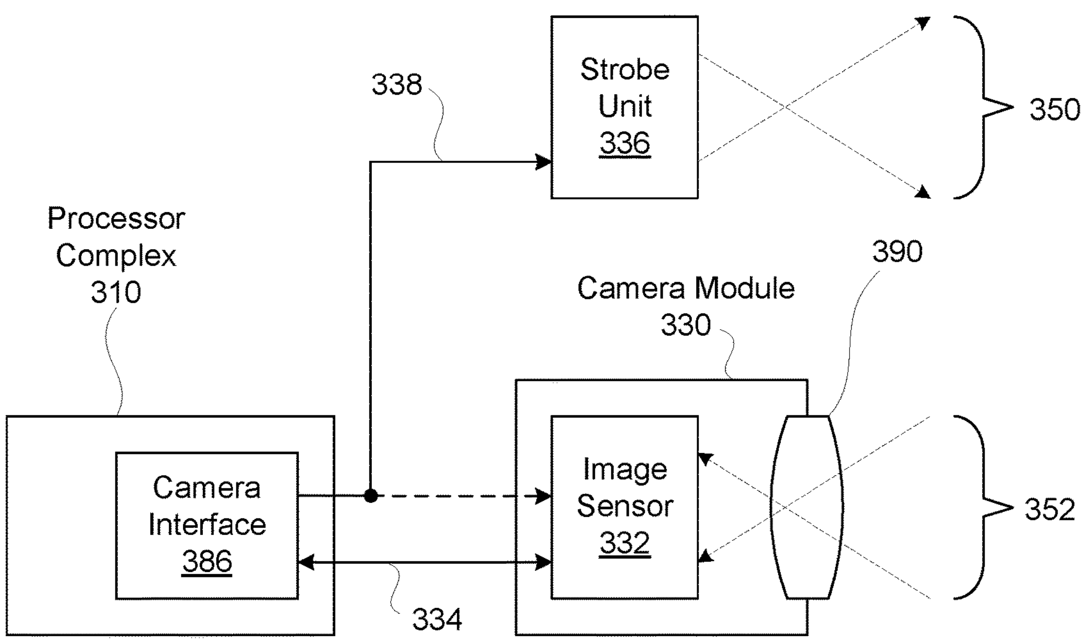


Figure 3F

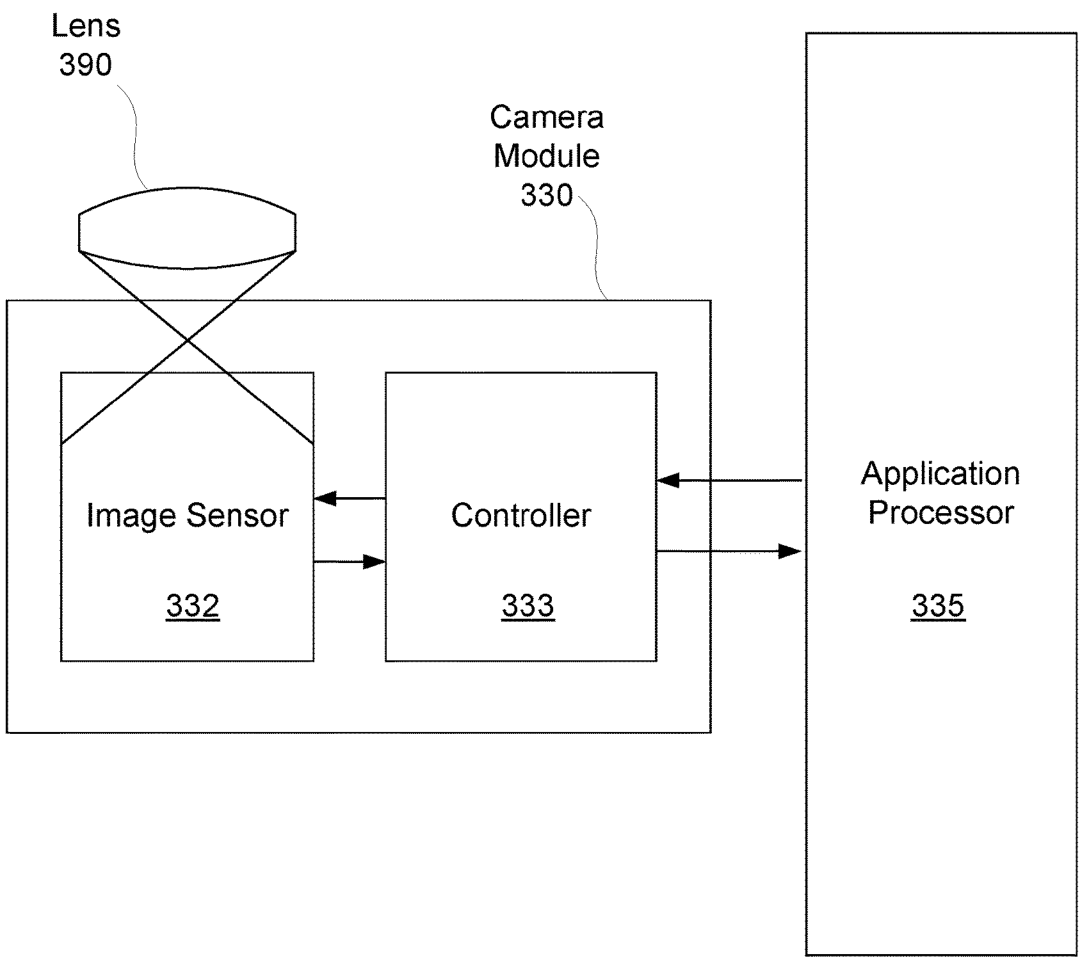

Lens
390
Camera
Module
330
Image Sensor
332
Controller
333
Application
Processor
335

Figure 3G

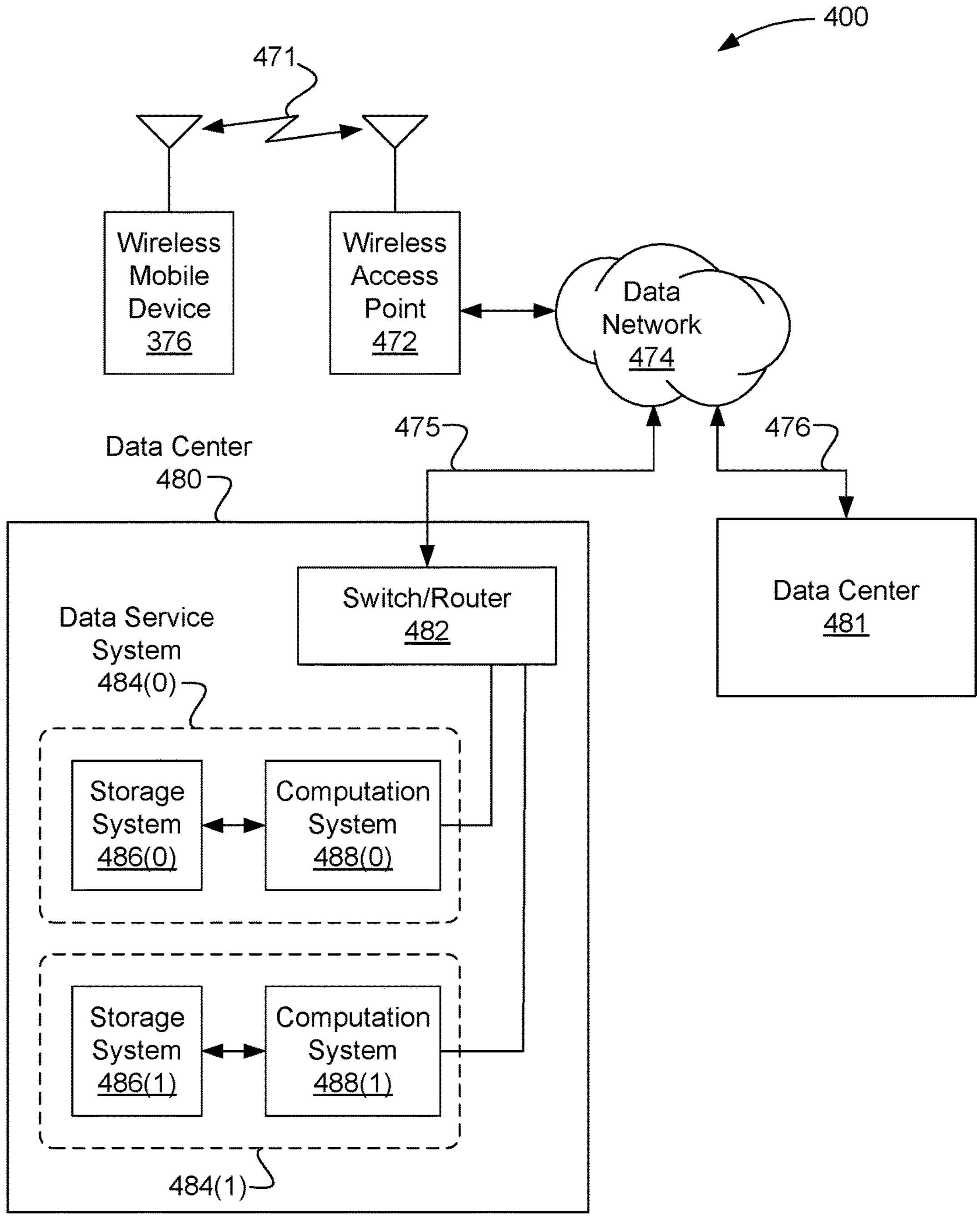

400
471
Wireless Mobile Device 376
Wireless Access Point 472
Data Network 474
475
476
Data Center 480
Switch/Router 482
Data Center 481
Data Service System 484(0)
Storage System 486(0)
Computation System 488(0)
Storage System 486(1)
Computation System 488(1)
484(1)

Figure 4

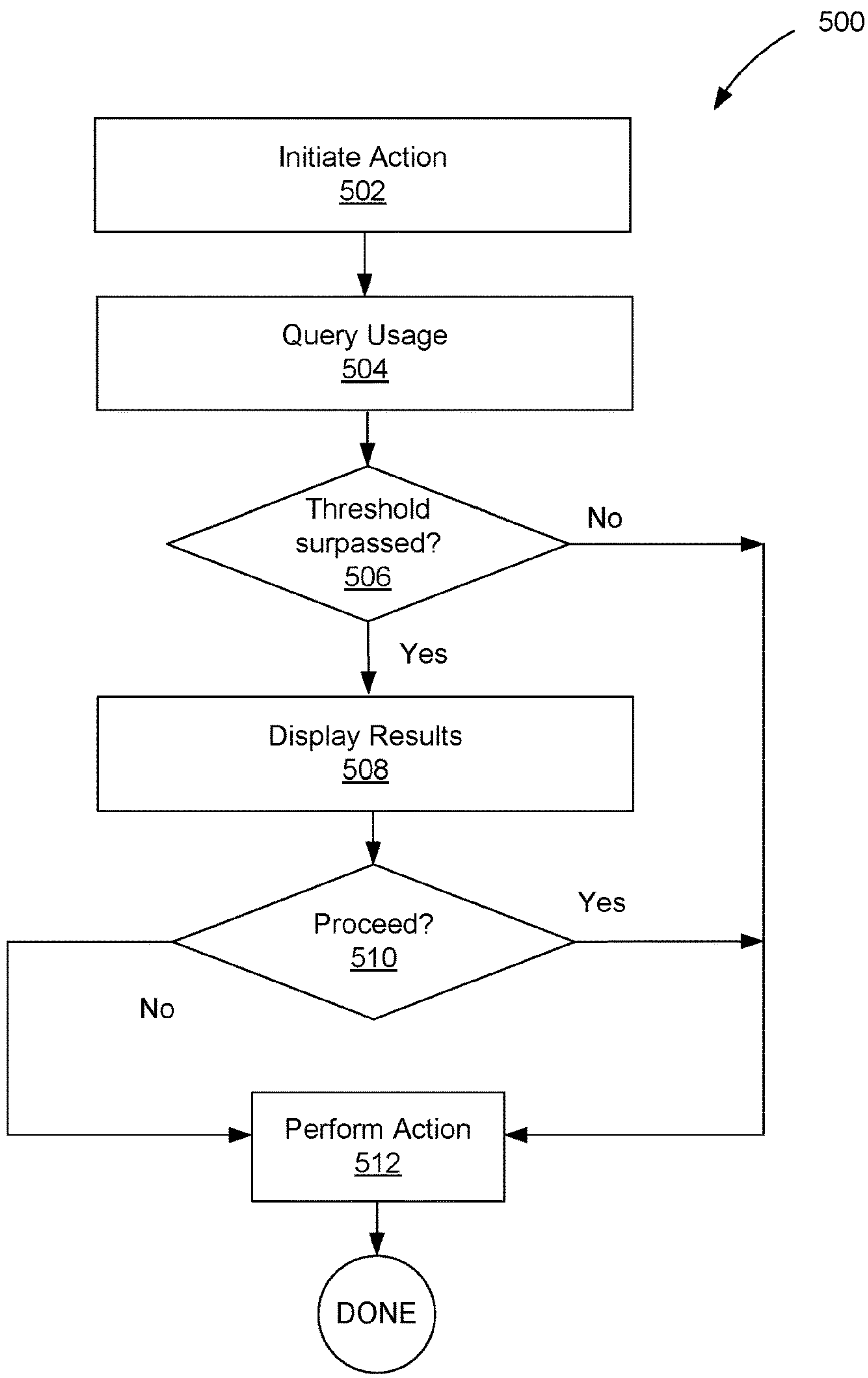

500
Initiate Action
502
Query Usage
504
Threshold surpassed?
506
No
Yes
Display Results
508
Proceed?
510
Yes
No
Perform Action
512
DONE

Figure 5

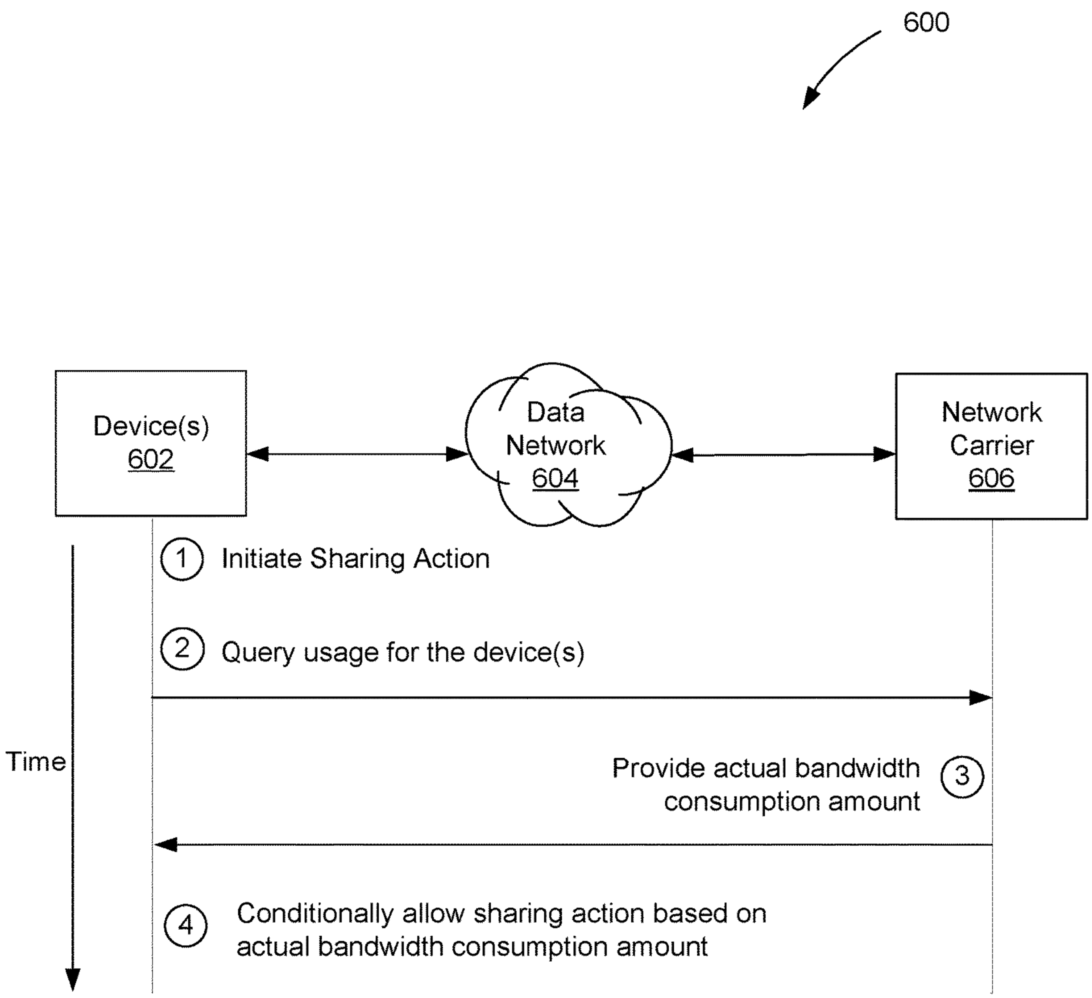

600
Device(s)
602
Data
Network
604
Network
Carrier
606
Time
1 Initiate Sharing Action
2 Query usage for the device(s)
Provide actual bandwidth
consumption amount 3
4 Conditionally allow sharing action based on
actual bandwidth consumption amount

Figure 6

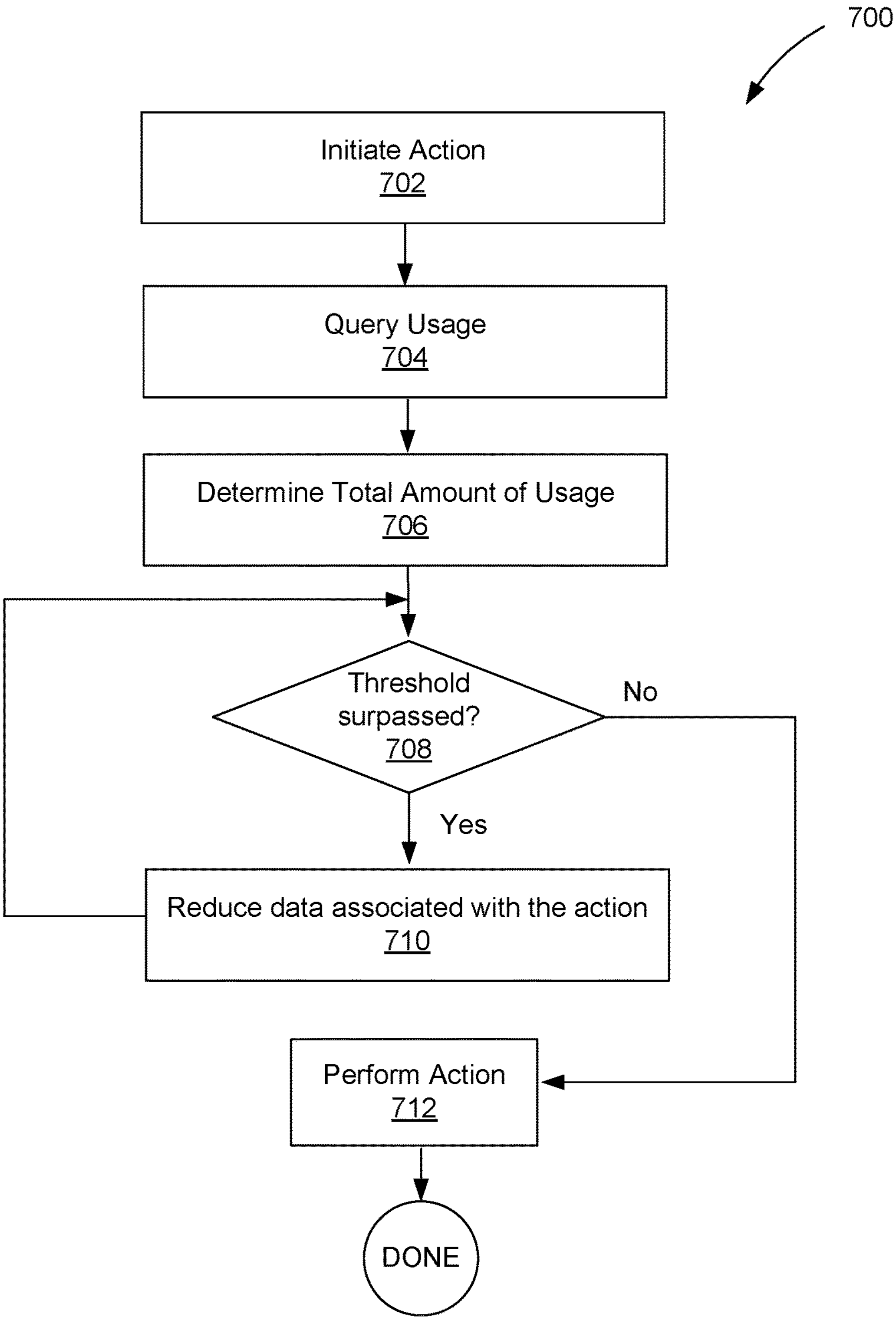

700
Initiate Action
702
Query Usage
704
Determine Total Amount of Usage
706
Threshold surpassed?
708
No
Yes
Reduce data associated with the action
710
Perform Action
712
DONE

Figure 7

SYSTEM AND METHOD FOR SHARING DATA BASED ON A COMBINED BANDWIDTH CONSUMPTION

RELATED APPLICATIONS

This application is a continuation of the following U.S. Patent Application, the entire disclosures being incorporated by reference herein: application Ser. No. 14/547,079, filed Nov. 18, 2014, entitled "SYSTEM AND METHOD FOR SHARING DATA BASED ON A COMBINED BANDWIDTH CONSUMPTION."

FIELD OF THE INVENTION

The present invention relates to sharing data, and more particularly to sharing data based on a combined bandwidth consumption.

BACKGROUND

Traditional mobile computing systems are limited by one or more data transmission limits associated with total bandwidth consumption. For example, a user's mobile account may be associated with an allocated bandwidth consumption amount. Further, bandwidth consumption amounts may now be shared amongst more than one device. However, use of the allocated bandwidth amongst more than one device can potentially be exceeded and be inaccurately tracked at each device. As such, there is thus a need for addressing these and/or other issues associated with the prior art.

SUMMARY

A system, method, and computer program product are provided for sharing data based on a combined bandwidth consumption. In use, a first sharing action is received. Next, a first bandwidth consumption is received. Further, a second bandwidth consumption is received. Additionally, it is determined whether a combination of the first bandwidth consumption and the second bandwidth consumption surpasses a predefined threshold. Lastly, the first sharing action is conditionally allowed based on the determination. Additional systems, methods, and computer program products are also presented.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows a method for sharing data based on a combined bandwidth consumption, in accordance with one embodiment.

FIG. **2** shows a system for sharing data based on a combined bandwidth consumption, in accordance with one embodiment.

FIG. **3**A illustrates a digital photographic system, in accordance with an embodiment.

FIG. **3**B illustrates a processor complex within the digital photographic system, according to one embodiment.

FIG. **3**C illustrates a digital camera, in accordance with an embodiment.

FIG. **3**D illustrates a wireless mobile device, in accordance with another embodiment.

FIG. **3**E illustrates a camera module configured to sample an image, according to one embodiment.

FIG. **3**F illustrates a camera module configured to sample an image, according to another embodiment.

FIG. **3**G illustrates a camera module in communication with an application processor, in accordance with an embodiment.

FIG. **4** illustrates a network service system, in accordance with another embodiment.

FIG. **5** illustrates a method for determining whether to perform an action, in accordance with another embodiment.

FIG. **6** illustrates a message sequence for determining bandwidth consumption, in accordance with another embodiment.

FIG. **7** illustrates a method for reducing data associated with an action, in accordance with another embodiment.

DETAILED DESCRIPTION

FIG. **1** shows a method **100** for sharing data based on a combined bandwidth consumption, in accordance with one embodiment. As an option, the method **100** may be implemented in the context of the details of any of the Figures. Of course, however, the method **100** may be carried out in any desired environment. Further, the aforementioned definitions may equally apply to the description below.

As shown, a first sharing action is received. See operation **102**. Next, a first user indication of a first bandwidth consumption is received. See operation **104**. Further, a second user indication of a second bandwidth consumption is received. See operation **106**.

In the context of the present description, a sharing action includes any action to share data in some manner. For example, in various embodiments, sharing action may include an action to transfer data from one client to another client, from a client to a server, from a server to a client, within a network, from a network to a second network, to the cloud, etc.

Additionally, in the context of the present description, bandwidth consumption is an amount of data conveyed through one or more networks (in other words, "used" or "consumed"). For example, in one embodiment, a user may have a wireless data connection provided as part of a data service plan associated with a mobile network carrier, and the user may transmit and/or receive data through the mobile network carrier, thereby consuming bandwidth against a data allocation specified in the data service plan. Bandwidth may be consumed by one or more sharing actions. In one embodiment, the first bandwidth consumption may comprise an amount of bandwidth consumed against a data allocation associated with a wireless data service (e.g. bandwidth consumed through a mobile network carrier), while the second bandwidth consumption may comprise an amount of data associated with performing an action, such the one or more sharing actions.

In one embodiment, the indication of the first bandwidth consumption may be received from a network carrier. For example, in one embodiment, the amount of data a user has used may be indicated by the mobile carrier. The second bandwidth consumption may be received by an application or sharing module executing within a client (e.g. a mobile device) that determines total data transmission requirements for a sharing action. In another embodiment, the first bandwidth consumption may be received from a peer-to-peer network usage tracking system or usage counter. For example, in one embodiment, each device among a collection of devices (e.g. on a shared data plan, etc.) may track individual data consumption for the device, and subsequently update other devices within the collection of devices with the individual data consumption information. With each device receiving individual data consumption information from all other devices within the collection of devices (e.g. on a shared data plan, etc.), collective consumption may be known to each device. A value for collective consumption may be determined by adding device consumption associated with individual data consumption information. In one embodiment, the value for collective consumption indicates a total amount of bandwidth consumed over all devices within a shared data plan.

In another embodiment, one or more usage parameters comprising the first bandwidth consumption may be received from a peer-to-peer network, and the peer-to-peer network may periodically receive updates from a network carrier regarding the first bandwidth consumption. For example, in one embodiment, each client in a collection of devices (e.g., on a shared data plan, etc.) may track device usage and share the device usage information with other devices within the collection of devices. In this way, each device within the collection of devices has complete device usage information for the whole collection of devices, and therefore total plan consumption. In one usage scenario, each device registered to a shared data plan is able to report total plan usage to a corresponding user by combining device usage values for devices registered to the shared data plan. Additionally, in certain embodiments, the total amount of bandwidth consumed (as locally reported and saved on each device) may be cross-checked with a network carrier to ensure that the total amount as determined by the devices is within a set range (e.g. within a few percentage points of difference, etc.). If the total amount is not within a set range, then the total amount (as saved by each of the devices) may be updated by the network carrier to reflect the latest total amount.

In one embodiment, a network carrier may provide the first user indication of the first bandwidth consumption in response to a query of usage associated with a first user. Additionally, the network carrier may provide the second user indication of the second bandwidth consumption in response to a query of usage associated with a potential sharing action. For example, in one embodiment, a network carrier may verify an account associated with a user to determine how much bandwidth has been consumed by that user (or collection of users/devices, etc.).

In one embodiment, each device within the collection of devices executes a background process that performs updates to a locally cached value for the first bandwidth consumption when the device is within a covered service area. For example, each device may perform a periodic (e.g. every ten minutes) update to the locally cached value of the first bandwidth consumption. In other embodiments, each device may query a network carrier data management system (e.g. an accounting system) to retrieve the first bandwidth consumption for an associated shared data plan. Still yet, in one embodiment, the first bandwidth consumption may reflect actual bandwidth consumption as calculated by a network carrier. Additionally, in another embodiment, the peer-to-peer network may provide individual data consumption information from all devices to each device associated with a shared data plan, thereby allowing each device to locally calculate the first bandwidth consumption for the shared data plan.

As shown, it is determined whether a combination of the first bandwidth consumption and the second bandwidth consumption surpasses a predefined threshold. See operation **108**. Lastly, the first sharing action is conditionally allowed based on the determination. See operation **110**.

In one embodiment, a predefined threshold may be a data limit (e.g. imposed by a network carrier, etc.). For example, the predefined threshold may be defined by a data plan total limit, or a limit associated with a per user portion of a data plan total limit. In another embodiment, if the predefined threshold is surpassed, the first sharing action may be denied or postponed pending user approval. For example, in one embodiment, if a user wants to upload a 100 MB collection of photos, and doing so would surpass a predefined threshold, then the upload would be denied or, alternatively, the user would need to confirm their decision to exceed the predefined threshold and optionally purchase an additional allocation of data. For example, in one embodiment, the predefined threshold may be reconfigured, including, for example, adding additional money and/or an additional bandwidth amount to a user's account. In such an embodiment, the predefined threshold may be adjusted. In one embodiment, the user may purchase an additional bandwidth amount for their exclusive use. Alternatively, the user may purchase an additional bandwidth amount to be shared among all users registered to the same account. Still yet, in one embodiment, the adjustment may include purchasing additional bandwidth associated with the shared account (or any account). In another embodiment, if the predefined threshold is not surpassed, the first sharing action may be fully allowed.

Further, in another embodiment, specific types of data may be excluded from measuring the first bandwidth consumption and the second bandwidth consumption. For example, in one embodiment, data associated with music, video, photos, and/or a device app may be excluded from data consumption associated with a user. In certain embodiments, music, videos, photos, or other content associated with a preferred service may be excluded from measuring the first bandwidth, but music, videos, photos, or other content from a non-preferred service may be included in measuring the first bandwidth. In one embodiment, a network carrier may track all data, but only specific types of data may be counted with respect to a predefined threshold.

In one embodiment, the conditionally allowing may depend on an effect of the first sharing action. Additionally, in one embodiment, the effect may include a total amount of bandwidth utilized as a result or potential result of the first sharing action. In a further embodiment, the first bandwidth consumption, the second bandwidth consumption, and the effect may be summed to determine whether the predefined threshold is surpassed. Moreover, the predefined threshold may be associated with a predefined limit associated with a first account, such as an account associated with a shared data plan.

For example, in one embodiment, an effect of the first sharing action may include transferring data which may exceed a predetermined threshold. Because the effect would exceed a predetermined threshold, the first sharing action may be denied or postponed pending user approval.

FIG. **2** shows a system **200** for sharing data based on a combined bandwidth consumption, in accordance with one embodiment. As an option, the system **200** may be implemented in the context of the details of any of the Figures. Of course, however, the system **200** may be carried out in any desired environment. Further, the aforementioned definitions may equally apply to the description below.

As shown, system **200** may include device **202**, server **204**, devices **206**, and a network **208**. In various embodiments, device **202** and devices **206** may include any device capable of transmitting data via a network system (e.g. mobile phone, tablet, desktop computer, etc.). In one embodiment, the device **202** may include a bandwidth consumption **210**, and the devices **206** may include a bandwidth consumption **214**. Further, the server **204** may include a bandwidth consumption **212**.

In one embodiment, the server **204** may monitor data usage for all devices for an account. The account may include device **202** and any number of additional devices, shown as devices **206**. As an example, the device **202** and at least one other device may be part of a single account plan with a shared data plan. In such an embodiment, the server **204** may track the bandwidth consumed for the device **202** and the at least one other device. Such tracking may be contained in bandwidth consumption **212**.

In another embodiment, the device **202** may track its own data usage, shown as bandwidth consumption **210**, and each of the other devices **206** may track their own data usage, shown as bandwidth consumption **214**. In such an embodiment, the bandwidth consumption **210** and the bandwidth consumption **214** may be synchronized between the device **202** and devices **206** such that the device **202** and the devices **206** retain an up-to-date indication of the data usage for each of the devices individually and collectively. In such an embodiment, the device **202** or the devices **206** may periodically verify the collective data usage (e.g. for device **202** and devices **206**, etc.) with the bandwidth consumption **212** of server **204**. In this manner, the device **202** and devices **206** may keep an accurate recording of the collective bandwidth usage for all devices on an account.

In a separate embodiment, data usage may be tracked solely by device **202** and devices **206**. However, in such an embodiment, the collective bandwidth consumption may not reflect the network carrier's data usage. For example, in one embodiment, a network carrier may not track usage for a specific type of data transfer (e.g. use of Pandora music, etc.). In another embodiment, header data and/or other packet data may be counted in a different manner by the network carrier (and/or may not even be detected by mobile device data usage counters, etc.). As such, a periodic update to a server (e.g. network carrier database, etc.) may assist in retaining accurate indications of bandwidth consumed.

In one embodiment, the need to determine bandwidth consumption may be triggered by a user initiating a sharing action which requires some amount of bandwidth consumption. For example, in one embodiment, a user may upload a photo, stream a video, chat, and/or consume data in any manner.

More illustrative information will now be set forth regarding various optional architectures and uses in which the foregoing method may or may not be implemented, per the desires of the user. It should be strongly noted that the following information is set forth for illustrative purposes and should not be construed as limiting in any manner. Any of the following features may be optionally incorporated with or without the exclusion of other features described.

FIG. **3**A illustrates a digital photographic system **300**, in accordance with one embodiment. As an option, the digital photographic system **300** may be implemented in the context of the details of any of the Figures disclosed herein. Of course, however, the digital photographic system **300** may be implemented in any desired environment. Further, the aforementioned definitions may equally apply to the description below.

As shown, the digital photographic system **300** may include a processor complex **310** coupled to a camera module **330** via an interconnect **334**. In one embodiment, the processor complex **310** is coupled to a strobe unit **336**. The digital photographic system **300** may also include, without limitation, a display unit **312**, a set of input/output devices **314**, non-volatile memory **316**, volatile memory **318**, a wireless unit **340**, and sensor devices **342**, each coupled to the processor complex **310**. In one embodiment, a power management subsystem **320** is configured to generate appropriate power supply voltages for each electrical load element within the digital photographic system **300**. A battery **322** may be configured to supply electrical energy to the power management subsystem **320**. The battery **322** may implement any technically feasible energy storage system, including primary or rechargeable battery technologies. Of course, in other embodiments, additional or fewer features, units, devices, sensors, or subsystems may be included in the system.

In one embodiment, a strobe unit **336** may be integrated into the digital photographic system **300** and configured to provide strobe illumination **350** during an image sample event performed by the digital photographic system **300**. In another embodiment, a strobe unit **336** may be implemented as an independent device from the digital photographic system **300** and configured to provide strobe illumination **350** during an image sample event performed by the digital photographic system **300**. The strobe unit **336** may comprise one or more LED devices, a gas-discharge illuminator (e.g. a Xenon strobe device, a Xenon flash lamp, etc.), or any other technically feasible illumination device. In certain embodiments, two or more strobe units are configured to synchronously generate strobe illumination in conjunction with sampling an image. In one embodiment, the strobe unit **336** is controlled through a strobe control signal **338** to either emit the strobe illumination **350** or not emit the strobe illumination **350**. The strobe control signal **338** may be implemented using any technically feasible signal transmission protocol. The strobe control signal **338** may indicate a strobe parameter (e.g. strobe intensity, strobe color, strobe time, etc.), for directing the strobe unit **336** to generate a specified intensity and/or color of the strobe illumination **350**. The strobe control signal **338** may be generated by the processor complex **310**, the camera module **330**, or by any other technically feasible combination thereof. In one embodiment, the strobe control signal **338** is generated by a camera interface unit within the processor complex **310** and transmitted to both the strobe unit **336** and the camera module **330** via the interconnect **334**. In another embodiment, the strobe control signal **338** is generated by the camera module **330** and transmitted to the strobe unit **336** via the interconnect **334**.

Optical scene information **352**, which may include at least a portion of the strobe illumination **350** reflected from objects in the photographic scene, is focused as an optical image onto an image sensor **332** within the camera module **330**. The image sensor **332** generates an electronic representation of the optical image. The electronic representation comprises spatial color intensity information, which may include different color intensity samples (e.g. red, green, and blue light, etc.). In other embodiments, the spatial color intensity information may also include samples for white light. The electronic representation is transmitted to the processor complex **310** via the interconnect **334**, which may implement any technically feasible signal transmission protocol.

In one embodiment, input/output devices **314** may include, without limitation, a capacitive touch input surface, a resistive tablet input surface, one or more buttons, one or more knobs, light-emitting devices, light detecting devices, sound emitting devices, sound detecting devices, or any other technically feasible device for receiving user input and converting the input to electrical signals, or converting electrical signals into a physical signal. In one embodiment, the input/output devices **314** include a capacitive touch input surface coupled to a display unit **312**. A touch entry display system may include the display unit **312** and a capacitive touch input surface, also coupled to processor complex **310**.

Additionally, in other embodiments, non-volatile (NV) memory **316** is configured to store data when power is interrupted. In one embodiment, the NV memory **316** comprises one or more flash memory devices (e.g. ROM, PCM, FeRAM, FRAM, PRAM, MRAM, NRAM, etc.). The NV memory **316** comprises a non-transitory computer-readable medium, which may be configured to include programming instructions for execution by one or more processing units within the processor complex **310**. The programming instructions may implement, without limitation, an operating system (OS), UI software modules, image processing and storage software modules, one or more input/output devices **314** connected to the processor complex **310**, one or more software modules for sampling an image stack through camera module **330**, one or more software modules for presenting the image stack or one or more synthetic images generated from the image stack through the display unit **312**. As an example, in one embodiment, the programming instructions may also implement one or more software modules for merging images or portions of images within the image stack, aligning at least portions of each image within the image stack, or a combination thereof. In another embodiment, the processor complex **310** may be configured to execute the programming instructions, which may implement one or more software modules operable to create a high dynamic range (HDR) image.

Still yet, in one embodiment, one or more memory devices comprising the NV memory **316** may be packaged as a module configured to be installed or removed by a user. In one embodiment, volatile memory **318** comprises dynamic random access memory (DRAM) configured to temporarily store programming instructions, image data such as data associated with an image stack, and the like, accessed during the course of normal operation of the digital photographic system **300**. Of course, the volatile memory may be used in any manner and in association with any other input/output device **314** or sensor device **342** attached to the process complex **310**.

In one embodiment, sensor devices **342** may include, without limitation, one or more of an accelerometer to detect motion and/or orientation, an electronic gyroscope to detect motion and/or orientation, a magnetic flux detector to detect orientation, a global positioning system (GPS) module to detect geographic position, or any combination thereof. Of course, other sensors, including but not limited to a motion detection sensor, a proximity sensor, an RGB light sensor, a gesture sensor, a 3-D input image sensor, a pressure sensor, and an indoor position sensor, may be integrated as sensor devices. In one embodiment, the sensor devices may be one example of input/output devices **314**.

Wireless unit **340** may include one or more digital radios configured to send and receive digital data. In particular, the wireless unit **340** may implement wireless standards (e.g. WiFi, Bluetooth, NFC, etc.), and may implement digital cellular telephony standards for data communication (e.g. CDMA, 3G, 4G, LTE, LTE-Advanced, etc.). Of course, any wireless standard or digital cellular telephony standards may be used.

In one embodiment, the digital photographic system **300** is configured to transmit one or more digital photographs to a network-based (online) or "cloud-based" photographic media service via the wireless unit **340**. The one or more digital photographs may reside within either the NV memory **316** or the volatile memory **318**, or any other memory device associated with the processor complex **310**. In one embodiment, a user may possess credentials to access an online photographic media service and to transmit one or more digital photographs for storage to, retrieval from, and presentation by the online photographic media service. The credentials may be stored or generated within the digital photographic system **300** prior to transmission of the digital photographs. The online photographic media service may comprise a social networking service, photograph sharing service, or any other network-based service that provides storage of digital photographs, processing of digital photographs, transmission of digital photographs, sharing of digital photographs, or any combination thereof. In certain embodiments, one or more digital photographs are generated by the online photographic media service based on image data (e.g. image stack, HDR image stack, image package, etc.) transmitted to servers associated with the online photographic media service. In such embodiments, a user may upload one or more source images from the digital photographic system **300** for processing by the online photographic media service.

In one embodiment, the digital photographic system **300** comprises at least one instance of a camera module **330**. In another embodiment, the digital photographic system **300** comprises a plurality of camera modules **330**. Such an embodiment may also include at least one strobe unit **336** configured to illuminate a photographic scene, sampled as multiple views by the plurality of camera modules **330**. The plurality of camera modules **330** may be configured to sample a wide angle view (e.g., greater than forty-five degrees of sweep among cameras) to generate a panoramic photograph. In one embodiment, a plurality of camera modules **330** may be configured to sample two or more narrow angle views (e.g., less than forty-five degrees of sweep among cameras) to generate a stereoscopic photograph. In other embodiments, a plurality of camera modules **330** may be configured to generate a 3-D image or to otherwise display a depth perspective (e.g. a z-component, etc.) as shown on the display unit **312** or any other display device.

In one embodiment, a display unit **312** may be configured to display a two-dimensional array of pixels to form an image for display. The display unit **312** may comprise a liquid-crystal (LCD) display, a light-emitting diode (LED) display, an organic LED display, or any other technically feasible type of display. In certain embodiments, the display unit **312** may be able to display a narrower dynamic range of image intensity values than a complete range of intensity values sampled from a photographic scene, such as within a single HDR image or over a set of two or more images comprising a multiple exposure or HDR image stack. In one embodiment, images comprising an image stack may be merged according to any technically feasible HDR blending technique to generate a synthetic image for display within dynamic range constraints of the display unit **312**. In one embodiment, the limited dynamic range may specify an eight-bit per color channel binary representation of corresponding color intensities. In other embodiments, the limited dynamic range may specify more than eight-bits (e.g., 10 bits, 12 bits, or 14 bits, etc.) per color channel binary representation.

FIG. **3**B illustrates a processor complex **310** within the digital photographic system **300** of FIG. **3**A, in accordance with one embodiment. As an option, the processor complex **310** may be implemented in the context of the details of any of the Figures disclosed herein. Of course, however, the processor complex **310** may be implemented in any desired environment. Further, the aforementioned definitions may equally apply to the description below.

As shown, the processor complex **310** includes a processor subsystem **360** and may include a memory subsystem **362**. In one embodiment, processor complex **310** may comprise a system on a chip (SoC) device that implements processor subsystem **360**, and memory subsystem **362** comprises one or more DRAM devices coupled to the processor subsystem **360**. In another embodiment, the processor complex **310** may comprise a multi-chip module (MCM) encapsulating the SoC device and the one or more DRAM devices comprising the memory subsystem **362**.

The processor subsystem **360** may include, without limitation, one or more central processing unit (CPU) cores **370**, a memory interface **380**, input/output interfaces unit **384**, and a display interface unit **382**, each coupled to an interconnect **374**. The one or more CPU cores **370** may be configured to execute instructions residing within the memory subsystem **362**, volatile memory **318**, NV memory **316**, or any combination thereof. Each of the one or more CPU cores **370** may be configured to retrieve and store data through interconnect **374** and the memory interface **380**. In one embodiment, each of the one or more CPU cores **370** may include a data cache, and an instruction cache. Additionally, two or more of the CPU cores **370** may share a data cache, an instruction cache, or any combination thereof. In one embodiment, a cache hierarchy is implemented to provide each CPU core **370** with a private cache layer, and a shared cache layer.

In some embodiments, processor subsystem **360** may include one or more graphics processing unit (GPU) cores **372**. Each GPU core **372** may comprise a plurality of multi-threaded execution units that may be programmed to implement, without limitation, graphics acceleration functions. In various embodiments, the GPU cores **372** may be configured to execute multiple thread programs according to well-known standards (e.g. OpenGL™ WebGL™, OpenCL™, CUDA™, etc.), and/or any other programmable rendering graphic standard. In certain embodiments, at least one GPU core **372** implements at least a portion of a motion estimation function, such as a well-known Harris detector or a well-known Hessian-Laplace detector. Such a motion estimation function may be used at least in part to align images or portions of images within an image stack. For example, in one embodiment, an HDR image may be compiled based on an image stack, where two or more images are first aligned prior to compiling the HDR image.

As shown, the interconnect **374** is configured to transmit data between and among the memory interface **380**, the display interface unit **382**, the input/output interfaces unit **384**, the CPU cores **370**, and the GPU cores **372**. In various embodiments, the interconnect **374** may implement one or more buses, one or more rings, a cross-bar, a mesh, or any other technically feasible data transmission structure or technique. The memory interface **380** is configured to couple the memory subsystem **362** to the interconnect **374**. The memory interface **380** may also couple NV memory **316**, volatile memory **318**, or any combination thereof to the interconnect **374**. The display interface unit **382** may be configured to couple a display unit **312** to the interconnect **374**. The display interface unit **382** may implement certain frame buffer functions (e.g. frame refresh, etc.). Alternatively, in another embodiment, the display unit **312** may implement certain frame buffer functions (e.g. frame refresh, etc.). The input/output interfaces unit **384** may be configured to couple various input/output devices to the interconnect **374**.

In certain embodiments, a camera module **330** is configured to store exposure parameters for sampling each image associated with an image stack. For example, in one embodiment, when directed to sample a photographic scene, the camera module **330** may sample a set of images comprising the image stack according to stored exposure parameters. A software module comprising programming instructions executing within a processor complex **310** may generate and store the exposure parameters prior to directing the camera module **330** to sample the image stack. In other embodiments, the camera module **330** may be used to meter an image or an image stack, and the software module comprising programming instructions executing within a processor complex **310** may generate and store metering parameters prior to directing the camera module **330** to capture the image. Of course, the camera module **330** may be used in any manner in combination with the processor complex **310**.

In one embodiment, exposure parameters associated with images comprising the image stack may be stored within an exposure parameter data structure that includes exposure parameters for one or more images. In another embodiment, a camera interface unit (not shown in FIG. **3**B) within the processor complex **310** may be configured to read exposure parameters from the exposure parameter data structure and to transmit associated exposure parameters to the camera module **330** in preparation of sampling a photographic scene. After the camera module **330** is configured according to the exposure parameters, the camera interface may direct the camera module **330** to sample the photographic scene; the camera module **330** may then generate a corresponding image stack. The exposure parameter data structure may be stored within the camera interface unit, a memory circuit within the processor complex **310**, volatile memory **318**, NV memory **316**, the camera module **330**, or within any other technically feasible memory circuit. Further, in another embodiment, a software module executing within processor complex **310** may generate and store the exposure parameter data structure.

FIG. **3**C illustrates a digital camera **302**, in accordance with one embodiment. As an option, the digital camera **302** may be implemented in the context of the details of any of the Figures disclosed herein. Of course, however, the digital camera **302** may be implemented in any desired environment. Further, the aforementioned definitions may equally apply to the description below.

In one embodiment, the digital camera **302** may be configured to include a digital photographic system, such as digital photographic system **300** of FIG. **3**A. As shown, the digital camera **302** includes a camera module **330**, which may include optical elements configured to focus optical scene information representing a photographic scene onto an image sensor, which may be configured to convert the optical scene information to an electronic representation of the photographic scene.

Additionally, the digital camera **302** may include a strobe unit **336**, and may include a shutter release button **315** for triggering a photographic sample event, whereby digital camera **302** samples one or more images comprising the electronic representation. In other embodiments, any other technically feasible shutter release mechanism may trigger the photographic sample event (e.g. such as a timer trigger or remote control trigger, etc.).

FIG. **3**D illustrates a wireless mobile device **376**, in accordance with one embodiment. As an option, the mobile device **376** may be implemented in the context of the details of any of the Figures disclosed herein. Of course, however, the mobile device **376** may be implemented in any desired environment. Further, the aforementioned definitions may equally apply to the description below.

In one embodiment, the mobile device **376** may be configured to include a digital photographic system (e.g. such as digital photographic system **300** of FIG. 3A), which is configured to sample a photographic scene. In various embodiments, a camera module **330** may include optical elements configured to focus optical scene information representing the photographic scene onto an image sensor, which may be configured to convert the optical scene information to an electronic representation of the photographic scene. Further, a shutter release command may be generated through any technically feasible mechanism, such as a virtual button, which may be activated by a touch gesture on a touch entry display system comprising display unit **312**, or a physical button, which may be located on any face or surface of the mobile device **376**. Of course, in other embodiments, any number of other buttons, external inputs/outputs, or digital inputs/outputs may be included on the mobile device **376**, and which may be used in conjunction with the camera module **330**.

As shown, in one embodiment, a touch entry display system comprising display unit **312** is disposed on the opposite side of mobile device **376** from camera module **330**. In certain embodiments, the mobile device **376** includes a user-facing camera module **331** and may include a user-facing strobe unit (not shown). Of course, in other embodiments, the mobile device **376** may include any number of user-facing camera modules or rear-facing camera modules, as well as any number of user-facing strobe units or rear-facing strobe units.

In some embodiments, the digital camera **302** and the mobile device **376** may each generate and store a synthetic image based on an image stack sampled by camera module **330**. The image stack may include one or more images sampled under ambient lighting conditions, one or more images sampled under strobe illumination from strobe unit **336**, or a combination thereof.

FIG. 3E illustrates camera module **330**, in accordance with one embodiment. As an option, the camera module **330** may be implemented in the context of the details of any of the Figures disclosed herein. Of course, however, the camera module **330** may be implemented in any desired environment. Further, the aforementioned definitions may equally apply to the description below.

In one embodiment, the camera module **330** may be configured to control strobe unit **336** through strobe control signal **338**. As shown, a lens **390** is configured to focus optical scene information **352** onto image sensor **332** to be sampled. In one embodiment, image sensor **332** advantageously controls detailed timing of the strobe unit **336** though the strobe control signal **338** to reduce inter-sample time between an image sampled with the strobe unit **336** enabled, and an image sampled with the strobe unit **336** disabled. For example, the image sensor **332** may enable the strobe unit **336** to emit strobe illumination **350** less than one microsecond (or any desired length) after image sensor **332** completes an exposure time associated with sampling an ambient image and prior to sampling a strobe image.

In other embodiments, the strobe illumination **350** may be configured based on a desired one or more target points. For example, in one embodiment, the strobe illumination **350** may light up an object in the foreground, and depending on the length of exposure time, may also light up an object in the background of the image. In one embodiment, once the strobe unit **336** is enabled, the image sensor **332** may then immediately begin exposing a strobe image. The image sensor **332** may thus be able to directly control sampling operations, including enabling and disabling the strobe unit **336** associated with generating an image stack, which may comprise at least one image sampled with the strobe unit **336** disabled, and at least one image sampled with the strobe unit **336** either enabled or disabled. In one embodiment, data comprising the image stack sampled by the image sensor **332** is transmitted via interconnect **334** to a camera interface unit **386** within processor complex **310**. In some embodiments, the camera module **330** may include an image sensor controller, which may be configured to generate the strobe control signal **338** in conjunction with controlling operation of the image sensor **332**.

FIG. 3F illustrates a camera module **330**, in accordance with one embodiment. As an option, the camera module **330** may be implemented in the context of the details of any of the Figures disclosed herein. Of course, however, the camera module **330** may be implemented in any desired environment. Further, the aforementioned definitions may equally apply to the description below.

In one embodiment, the camera module **330** may be configured to sample an image based on state information for strobe unit **336**. The state information may include, without limitation, one or more strobe parameters (e.g. strobe intensity, strobe color, strobe time, etc.), for directing the strobe unit **336** to generate a specified intensity and/or color of the strobe illumination **350**. In one embodiment, commands for configuring the state information associated with the strobe unit **336** may be transmitted through a strobe control signal **338**, which may be monitored by the camera module **330** to detect when the strobe unit **336** is enabled. For example, in one embodiment, the camera module **330** may detect when the strobe unit **336** is enabled or disabled within a microsecond or less of the strobe unit **336** being enabled or disabled by the strobe control signal **338**. To sample an image requiring strobe illumination, a camera interface unit **386** may enable the strobe unit **336** by sending an enable command through the strobe control signal **338**. In one embodiment, the camera interface unit **386** may be included as an interface of input/output interfaces **384** in a processor subsystem **360** of the processor complex **310** of FIG. 3B The enable command may comprise a signal level transition, a data packet, a register write, or any other technically feasible transmission of a command. The camera module **330** may sense that the strobe unit **336** is enabled and then cause image sensor **332** to sample one or more images requiring strobe illumination while the strobe unit **336** is enabled. In such an implementation, the image sensor **332** may be configured to wait for an enable signal destined for the strobe unit **336** as a trigger signal to begin sampling a new exposure.

In one embodiment, camera interface unit **386** may transmit exposure parameters and commands to camera module **330** through interconnect **334**. In certain embodiments, the camera interface unit **386** may be configured to directly control strobe unit **336** by transmitting control commands to the strobe unit **336** through strobe control signal **338**. By directly controlling both the camera module **330** and the strobe unit **336**, the camera interface unit **386** may cause the camera module **330** and the strobe unit **336** to perform their respective operations in precise time synchronization. In one embodiment, precise time synchronization may be less than five hundred microseconds of event timing error. Additionally, event timing error may be a difference in time from an intended event occurrence to the time of a corresponding actual event occurrence.

In another embodiment, camera interface unit **386** may be configured to accumulate statistics while receiving image data from camera module **330**. In particular, the camera interface unit **386** may accumulate exposure statistics for a given image while receiving image data for the image through interconnect **334**. Exposure statistics may include, without limitation, one or more of an intensity histogram, a count of over-exposed pixels, a count of under-exposed pixels, an intensity-weighted sum of pixel intensity, or any combination thereof. The camera interface unit **386** may present the exposure statistics as memory-mapped storage locations within a physical or virtual address space defined by a processor, such as one or more of CPU cores **370**, within processor complex **310**. In one embodiment, exposure statistics reside in storage circuits that are mapped into a memory-mapped register space, which may be accessed through the interconnect **334**. In other embodiments, the exposure statistics are transmitted in conjunction with transmitting pixel data for a captured image. For example, the exposure statistics for a given image may be transmitted as in-line data, following transmission of pixel intensity data for the captured image. Exposure statistics may be calculated, stored, or cached within the camera interface unit **386**.

In one embodiment, camera interface unit **386** may accumulate color statistics for estimating scene white-balance. Any technically feasible color statistics may be accumulated for estimating white balance, such as a sum of intensities for different color channels comprising red, green, and blue color channels. The sum of color channel intensities may then be used to perform a white-balance color correction on an associated image, according to a white-balance model such as a gray-world white-balance model. In other embodiments, curve-fitting statistics are accumulated for a linear or a quadratic curve fit used for implementing white-balance correction on an image.

In one embodiment, camera interface unit **386** may accumulate spatial color statistics for performing color-matching between or among images, such as between or among an ambient image and one or more images sampled with strobe illumination. As with the exposure statistics, the color statistics may be presented as memory-mapped storage locations within processor complex **310**. In one embodiment, the color statistics are mapped in a memory-mapped register space, which may be accessed through interconnect **334**, within processor subsystem **360**. In other embodiments, the color statistics may be transmitted in conjunction with transmitting pixel data for a captured image. For example, in one embodiment, the color statistics for a given image may be transmitted as in-line data, following transmission of pixel intensity data for the image. Color statistics may be calculated, stored, or cached within the camera interface **386**.

In one embodiment, camera module **330** may transmit strobe control signal **338** to strobe unit **336**, enabling the strobe unit **336** to generate illumination while the camera module **330** is sampling an image. In another embodiment, camera module **330** may sample an image illuminated by strobe unit **336** upon receiving an indication signal from camera interface unit **386** that the strobe unit **336** is enabled. In yet another embodiment, camera module **330** may sample an image illuminated by strobe unit **336** upon detecting strobe illumination within a photographic scene via a rapid rise in scene illumination. In one embodiment, a rapid rise in scene illumination may include at least a rate of increasing intensity consistent with that of enabling strobe unit **336**. In still yet another embodiment, camera module **330** may enable strobe unit **336** to generate strobe illumination while sampling one image, and disable the strobe unit **336** while sampling a different image.

FIG. **3**G illustrates camera module **330**, in accordance with one embodiment. As an option, the camera module **330** may be implemented in the context of the details of any of the Figures disclosed herein. Of course, however, the camera module **330** may be implemented in any desired environment. Further, the aforementioned definitions may equally apply to the description below.

In one embodiment, the camera module **330** may be in communication with an application processor **335**. The camera module **330** is shown to include image sensor **332** in communication with a controller **333**. Further, the controller **333** is shown to be in communication with the application processor **335**.

In one embodiment, the application processor **335** may reside outside of the camera module **330**. As shown, the lens **390** may be configured to focus optical scene information onto image sensor **332** to be sampled. The optical scene information sampled by the image sensor **332** may then be communicated from the image sensor **332** to the controller **333** for at least one of subsequent processing and communication to the application processor **335**. In another embodiment, the controller **333** may control storage of the optical scene information sampled by the image sensor **332**, or storage of processed optical scene information.

In another embodiment, the controller **333** may enable a strobe unit to emit strobe illumination for a short time duration (e.g. less than one microsecond, etc.) after image sensor **332** completes an exposure time associated with sampling an ambient image. Further, the controller **333** may be configured to generate strobe control signal **338** in conjunction with controlling operation of the image sensor **332**.

In one embodiment, the image sensor **332** may be a complementary metal oxide semiconductor (CMOS) sensor or a charge-coupled device (CCD) sensor. In another embodiment, the controller **333** and the image sensor **332** may be packaged together as an integrated system or integrated circuit. In yet another embodiment, the controller **333** and the image sensor **332** may comprise discrete packages. In one embodiment, the controller **333** may provide circuitry for receiving optical scene information from the image sensor **332**, processing of the optical scene information, timing of various functionalities, and signaling associated with the application processor **335**. Further, in another embodiment, the controller **333** may provide circuitry for control of one or more of exposure, shuttering, white balance, and gain adjustment. Processing of the optical scene information by the circuitry of the controller **333** may include one or more of gain application, amplification, and analog-to-digital conversion. After processing the optical scene information, the controller **333** may transmit corresponding digital pixel data, such as to the application processor **335**.

In one embodiment, the application processor **335** may be implemented on processor complex **310** and at least one of volatile memory **318** and NV memory **316**, or any other memory device and/or system. The application processor **335** may be previously configured for processing of received optical scene information or digital pixel data communicated from the camera module **330** to the application processor **335**.

FIG. **4** illustrates a network service system **400**, in accordance with one embodiment. As an option, the network service system **400** may be implemented in the context of the details of any of the Figures disclosed herein. Of course, however, the network service system **400** may be implemented in any desired environment. Further, the aforementioned definitions may equally apply to the description below.

In one embodiment, the network service system **400** may be configured to provide network access to a device implementing a digital photographic system. As shown, network service system **400** includes a wireless mobile device **376**, a wireless access point **472**, a data network **474**, data center **480**, and a data center **481**. The wireless mobile device **376** may communicate with the wireless access point **472** via a digital radio link **471** to send and receive digital data, including data associated with digital images. The wireless mobile device **376** and the wireless access point **472** may implement any technically feasible transmission techniques for transmitting digital data via digital a radio link **471** without departing the scope and spirit of the present invention. In certain embodiments, one or more of data centers **480**, **481** may be implemented using virtual constructs so that each system and subsystem within a given data center **480**, **481** may comprise virtual machines configured to perform specified data processing and network tasks. In other implementations, one or more of data centers **480**, **481** may be physically distributed over a plurality of physical sites.

The wireless mobile device **376** may comprise a smart phone configured to include a digital camera, a digital camera configured to include wireless network connectivity, a reality augmentation device, a laptop configured to include a digital camera and wireless network connectivity, or any other technically feasible computing device configured to include a digital photographic system and wireless network connectivity.

In various embodiments, the wireless access point **472** may be configured to communicate with wireless mobile device **376** via the digital radio link **471** and to communicate with the data network **474** via any technically feasible transmission media, such as any electrical, optical, or radio transmission media. For example, in one embodiment, wireless access point **472** may communicate with data network **474** through an optical fiber coupled to the wireless access point **472** and to a router system or a switch system within the data network **474**. A network link **475**, such as a wide area network (WAN) link, may be configured to transmit data between the data network **474** and the data center **480**.

In one embodiment, the data network **474** may include routers, switches, long-haul transmission systems, provisioning systems, authorization systems, and any technically feasible combination of communications and operations subsystems configured to convey data between network endpoints, such as between the wireless access point **472** and the data center **480**. In one implementation, a wireless the mobile device **376** may comprise one of a plurality of wireless mobile devices configured to communicate with the data center **480** via one or more wireless access points coupled to the data network **474**.

Additionally, in various embodiments, the data center **480** may include, without limitation, a switch/router **482** and at least one data service system **484**. The switch/router **482** may be configured to forward data traffic between and among a network link **475**, and each data service system **484**. The switch/router **482** may implement any technically feasible transmission techniques, such as Ethernet media layer transmission, layer **2** switching, layer **3** routing, and the like. The switch/router **482** may comprise one or more individual systems configured to transmit data between the data service systems **484** and the data network **474**.

In one embodiment, the switch/router **482** may implement session-level load balancing among a plurality of data service systems **484**. Each data service system **484** may include at least one computation system **488** and may also include one or more storage systems **486**. Each computation system **488** may comprise one or more processing units, such as a central processing unit, a graphics processing unit, or any combination thereof. A given data service system **484** may be implemented as a physical system comprising one or more physically distinct systems configured to operate together. Alternatively, a given data service system **484** may be implemented as a virtual system comprising one or more virtual systems executing on an arbitrary physical system. In certain scenarios, the data network **474** may be configured to transmit data between the data center **480** and another data center **481**, such as through a network link **476**.

In another embodiment, the network service system **400** may include any networked mobile devices configured to implement one or more embodiments of the present invention. For example, in some embodiments, a peer-to-peer network, such as an ad-hoc wireless network, may be established between two different wireless mobile devices. In such embodiments, digital image data may be transmitted between the two wireless mobile devices without having to send the digital image data to a data center **480**.

FIG. **5** illustrates a method **500** for determining whether to perform an action, in accordance with another embodiment. As an option, the method **500** may be carried out in the context of the details of any of the Figures. Of course, however, the method **500** may be carried out in any desired environment. Further, the aforementioned definitions may equally apply to the description below.

As shown, an action is initiated. See operation **502**. Next, usage is queried. See operation **504**. Further, it is determined whether a threshold is surpassed. See decision **506**.

In one embodiment, the action may require some amount of bandwidth consumption, thereby necessitating querying for the amount of usage. In various embodiments, the usage may be associated with one or more devices (e.g. single account with single device, single account with multiple devices, etc.).

In another embodiment, the threshold may be imposed by a network carrier. For example, in one embodiment, a mobile plan may include a bandwidth amount of 3 GB per billing cycle (e.g. on a monthly basis, etc.). As such, before initiating the action, it is verified whether the total usage amount may exceed the total bandwidth amount as monitored by the network carrier.

Additionally, in one embodiment, verifying whether a threshold has been surpassed may include verifying whether the devices have thus far surpassed the data limit, or are coming within a set threshold of the limit. In another embodiment, verifying whether a threshold has been surpassed may include verifying whether the total amount thus far in combination with the amount of data needed to perform the action would surpass a data limit.

As shown, if the threshold is not surpassed, the action is performed. See operation **512**. However, if the threshold is surpassed, results are displayed. See operation **508**. For example, in various embodiments, results being displayed may include providing a screen indicating that performing the action would cause the data usage to come within a set threshold (e.g. within 10%, etc.) of the data limit. In another embodiment, the results being displayed may include providing a screen indicating that the data amount has been surpassed and the action cannot be performed. In certain embodiments, total consumption may be displayed to a user regardless of whether the threshold is surpassed to assist the user in tracking total usage of the account. Various embodiments may implement varying degrees of coherence with respect to usage data stored locally within each device associated with a data plan.

In a separate embodiment, an option may be presented to the user whereby the user may indicate the speed for transferring the data. For example, in one embodiment, the user may not need the data shared as quickly. Therefore, the user may select to share the data on a slower speed (e.g. 2G, 3G, etc.). In one embodiment, the ability to select a speed may be presented if a user has exceeded, or is within a percentage of exceeding, the data usage threshold. For example, the user may elect to transmit data over a "4G" wireless connection (which may provide unlimited data usage under a plan) rather than an LTE wireless connection (which may provide limited data per month).

As shown, it is determined whether to proceed. See decision **510**. In one embodiment, an option to select "yes" or "no" may be presented to the user, along with information indicating how much data remains on the account, and how much of the remaining data will be consumed by performing the action. In one embodiment, the user may select to purchase an additional amount of data.

In another embodiment, the action to be performed may be delayed. For example, in one embodiment, it may be determined that the user is within a set amount of time (e.g. 2 days, etc.) until the next billing cycle (and allocation of data, etc.), and may choose to defer the action until the next cycle begins. In this manner, actions to be performed may be queued until a new data allocation becomes available. In a separate embodiment, data becoming available may include determining that the device is connected to a separate network (e.g. without a data restriction, such as a WiFi connection, etc.), thereby allowing the action to be performed without affecting the data threshold and/or usage.

FIG. **6** illustrates a message sequence **600** for determining bandwidth consumption, in accordance with another embodiment. As an option, the message sequence **600** may be carried out in the context of the details of any of the Figures. Of course, however, message sequence **600** may be carried out in any desired environment. Further, the aforementioned definitions may equally apply to the description below.

As shown, message sequence **600** includes device(s) **602**, a data network **604**, and a network carrier **606**.

At step one, the device initiates a sharing action. Sharing action may be analogous to operation **502** in FIG. **5**, the description disclosed herein. At step two, the data usage is queried for the device(s). In one embodiment, the data usage may be associated with two or more devices.

At step three, the network carrier provides actual bandwidth consumption amount. In one embodiment, the actual bandwidth consumption amount may include the total amount of bandwidth consumed associated with the devices on the account. In another embodiment, the actual bandwidth consumption amount may indicate the total adjusted consumption, wherein one or more data items are excluded (e.g. music streaming, etc.) from the complete bandwidth usage.

At step four, the device(s) conditionally allow sharing action based on actual bandwidth consumption amount. In one embodiment, the conditionally allow may be analogous to operation **110** in FIG. **1**, the description disclosed herein.

FIG. **7** illustrates a method **700** for reducing data associated with an action, in accordance with another embodiment. As an option, the method **700** may be carried out in the context of the details of any of the Figures. Of course, however, method **700** may be carried out in any desired environment. Further, the aforementioned definitions may equally apply to the description below.

As shown, an action is initiated. See operation **702**. Next, usage is queried. See operation **704**. Further, a total amount of usage is determined. See operation **706**.

In one embodiment, the action may require some amount of bandwidth consumption, thereby necessitating querying for the amount of usage. In various embodiments, the usage may be associated with one or more devices (e.g. single account with single device, single account with multiple devices, etc.).

In another embodiment, the threshold may be imposed by a network carrier. For example, in one embodiment, a mobile plan may include a bandwidth amount of 3 GB per billing cycle (e.g. on a monthly basis, etc.). As such, before initiating the action, it is verified whether the total usage amount may exceed the total bandwidth amount as monitored by the network carrier.

Additionally, in one embodiment, verifying whether a threshold has been surpassed may include verifying whether the devices have thus far surpassed the data limit, or are coming within a set threshold of the limit. In another embodiment, verifying whether a threshold has been surpassed may include verifying whether the total amount thus far (e.g. the first bandwidth consumption of FIG. **1**) in combination with the amount of data needed to perform the action (e.g. the second bandwidth consumption of FIG. **1**) would surpass a data limit.

As shown, it is determined whether a threshold is surpassed. See decision **708**. As shown, if the threshold is not surpassed, the action is performed. See operation **712**. However, if the threshold is surpassed, then data associated with the action is reduced. See operation **710**. In one embodiment, data may be reduced by decreasing resolution, size, quality, etc. In another embodiment, if data is reduced below a threshold quality (e.g. as indicated by user feedback, etc.), then the action associated with the data may not be performed. In a separate embodiment, a slider may be associated with the data reduction such that moving the slider may balance quality and data. For example, in one embodiment, sliding a slider to the right might increase quality but also increase size associated with the data. Additionally, sliding the slider to the left might decrease quality and decrease size associated with the data. Thus, in this manner, a user may control the quality and data size associated with the action.

While various embodiments have been described above, it should be understood that they have been presented by way of example only, and not limitation. Thus, the breadth and scope of a preferred embodiment should not be limited by any of the above-described exemplary embodiments, but should be defined only in accordance with the following claims and their equivalents.

What is claimed is:

1. A computer program product comprising computer executable instructions stored on a non-transitory computer readable medium that, when executed by a processor, instruct the processor to:

receive a first sharing action;

receive a first network bandwidth consumption, wherein the first network bandwidth consumption reflects actual network bandwidth consumption as calculated by a network carrier;

receive a second network bandwidth consumption;

determine whether a combination of the first network bandwidth consumption and the second network bandwidth consumption surpasses a predefined threshold; and

if the combination does not surpass the predefined threshold, allow the first sharing action based on the determination.

2. The computer program product of claim **1**, wherein the computer program product is operable such that the first network bandwidth consumption is received from a network carrier.

3. The computer program product of claim **1**, wherein the computer program product is operable such that the second network bandwidth consumption is received from a network carrier.

4. The computer program product of claim **1**, wherein the computer program product is operable such that the first network bandwidth consumption is calculated from consumption information received from a peer-to-peer network.

5. The computer program product of claim **2**, wherein the network carrier provides the first network bandwidth consumption in response to a query of usage associated with a first user.

6. The computer program product of claim **3**, wherein the network carrier provides the second network bandwidth consumption in response to a query of usage associated with the first sharing action.

7. The computer program product of claim **1**, wherein the computer program product is operable such that specific types of data are not included in the first network bandwidth consumption and second network bandwidth consumption.

8. The computer program product of claim **4**, wherein the peer-to-peer network monitors network bandwidth consumption associated with two or more devices.

9. The computer program product of claim **1**, wherein the computer program product is operable such that if the predefined threshold is surpassed, the first sharing action is denied.

10. The computer program product of claim **1**, wherein the computer program product is operable such that if the predefined threshold is not surpassed, the first sharing action is fully allowed.

11. The computer program product of claim **1**, wherein the computer program product is operable such that the first sharing action is allowed based on an effect of the first sharing action.

12. The computer program product of claim **11**, wherein the computer program product is operable such that the effect includes a total amount of network bandwidth utilized as a result of the first sharing action.

13. The computer program product of claim **1**, wherein the computer program product is operable such that the first network bandwidth consumption comprises an amount of network bandwidth consumed against a data allocation associated with a wireless data service, and the second network bandwidth consumption comprises an amount of data associated with performing the first sharing action.

14. The computer program product of claim **1**, wherein the computer program product is operable such that the predefined threshold is associated with a predefined limit associated with a first account.

15. The computer program product of claim **14**, wherein the computer program product is operable such that the predefined threshold is adjusted.

16. The computer program product of claim **15**, wherein the computer program product is operable such that the adjustment includes purchasing additional network bandwidth associated with the first account.

17. The computer program product of claim **1**, wherein the computer program product is operable such the first network bandwidth consumption and second network bandwidth consumption are received from a peer-to-peer network, the peer-to-peer network periodically receiving updates from a network carrier regarding the first network bandwidth consumption and the second network bandwidth consumption.

18. An apparatus, comprising:

a non-transitory memory storing instructions; and

one or more processors in communication with the non-transitory memory, wherein the one or more processors execute the instructions to:

receive a first sharing action;

receive a first network bandwidth consumption, wherein the first network bandwidth consumption reflects actual network bandwidth consumption as calculated by a network carrier;

receive a second network bandwidth consumption;

determine whether a combination of the first network bandwidth consumption and the second network bandwidth consumption surpasses a predefined threshold; and

if the combination does not surpass the predefined threshold, allow the first sharing action based on the determination.

19. A method, comprising:

receiving, using a processor, a first sharing action;

receiving a first network bandwidth consumption, using the processor, wherein the first network bandwidth consumption reflects actual network bandwidth consumption as calculated by a network carrier;

receiving, using the processor, a second network bandwidth consumption;

determining, using the processor, whether a combination of the first network bandwidth consumption and the second network bandwidth consumption surpasses a predefined threshold; and

if the combination does not surpass the predefined threshold, allowing, using the processor, the first sharing action based on the determination.

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